EXAMINATION OF ORGANIC COMPOUNDS IN THE HAYABUSA SAMPLES FROM THE ASTEROID ITOKAWA.

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Introduction: So far, two sample-return missions have provided samples for organic analyses; lunar soils by the Apollo Program [1] and cometary dust particles by the Stardust mission [2]. The Hayabusa mission has provided the first opportunity to examine the occurrence of organic matter directly on the surface of an asteroid. Asteroid Itokawa is an S-type asteroid, a parent body of LL5-6 ordinary chondrites [3]. Although it seems to be depleted in organic matter due to its high formation temperature, the organic matter may be delivered from comets or carbonaceous meteorites, and/or organic precursors may be implanted by solar wind [4]. In this study, organic compound analyses were performed for the solvent-extract of the Hayabusa particles.

Materials and Methods: Five particles (ca. 40 to 180 μm), which consist mainly of olivine and pyroxene in mineral composition, were rinsed with small amount of organic solvents in a diamond holder. After acid hydrolysis the amino acids with enantiomeric separation was analyzed by two-dimensional high performance liquid chromatography with highly sensitive fluorescence detection (detection limit; ~sub femto mole). Other organic compound analysis including a search for PAHs was performed using ToF-SIMS. Carbonaceous grains (ca. 50 μm) of Y791191 (CM2) were also analyzed as a reference.

Results and Discussion: The glycine (Gly) and DL-alanine (Ala) were observed from the particle extracts only at a procedural blank level. L-Ala was more enriched relative to D-Ala, indicating a terrestrial signature rather than asteroidal signatures. On the other hand, Gly, Ala and α-aminoisobutyric acid (~100 ppm) were detected in the HCl extract of Y791191, where Ala was present as a nearly racemic mixture. As to ToF-SIMS analysis, no substantial difference was observed in positive and negative ions between the Hayabusa sample and procedural blank. The concentration of indigenous organic compounds is less than ~ppm, if present.

References: [1] Harada, K. et al. (1971) *Science*, **173**, 433-435. [2] Sandford, S. et al. (2006) *Science*, **314**, 1720-1724. [3] Abe, M. et. al. (2006) *Science*, **312**, 1334-1338. [4] Fox, S. W. et al. (1976) *GCA*, **40**, 1069-1071.